Using Ecological and Water Resources Planning Tools to Achieve Sustainable Development Outcomes

SCWRC
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Overview

• System stresses
• Sustainable planning and design
• Case studies
• 8 tools to begin moving toward sustainable planning and design
Restoring the Future
moving towards sustainability

Agriculture and Environment
Impaired Watersheds for Human Population and Fecal Coliforms
South Carolina

Source: http://www.strom.clemson.edu (Research by Allen and Lu)
We Need a Paradigm Shift
Sustainable Planning and Design

• The objective of sustainable planning and design is to have a neutral impact on the environment and human health by sensibly using resources and limiting disturbances.

• Ecosystems provide critical services that represent the basic ingredients of life, including oxygen, fresh water, nutrients and energy. The natural environment, in essence, is comprised of a *living infrastructure*.

• The concept of *living infrastructure* recognizes these vital contributions to human welfare and seeks ways and means by which ecosystem services can enhance both the built and natural environment concurrently.

• Incorporating a *living infrastructure* within areas of development also serves to restore processes that support conservation efforts adjacent to developed areas.

• To aspire toward sustainable, restorative or regenerative design, decisions must be informed by the general ecological processes occurring on the site, processes that represent a *living infrastructure*. 
• Regional ecological assessment and land development suitability analysis.

• Goal of the analysis— Identify land areas that are most conducive for land conservation and land development with regards to regional and local ecological processes, functions and resiliency.

• Focus of approach:
  - regional
  - process and function
  - conservation > restoration > development
Methodology

- GIS mapping (existing data layers)
- Analysis
  - Scientific and value driven
  - Identify important ecological attributes based on:
    + relationship to regional landscape processes
    + role in governing ecological processes and resiliency (cause and effect relationships)
    + uniqueness and rarity
Methodology

- GIS mapping
  - Soils
  - Wetlands
  - Flood Prone Areas
  - Habitat
  - Riparian Areas
  - Forests
  - Other Land Cover
  - Critical Areas
Case Studies

• City of Aiken, SC
• City of Cambridge, MD
• University of North Carolina at Chapel Hill
• Open Space Initiative in Comprehensive Planning Area (~70 mi²)

• Want to know what is important, and rank areas for potential protection

• Less resolution due to budgetary constraints

• 2-dimensional analysis- one layer, no collapsing
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Comprehensive Planning Area
City of Aiken Environmental Assessment

Legend
- Comprehensive Planning Area
- County Rivers
- Highways/Major Arterials
- County Lakes
- Railroad

Biohabitats Incorporated
Forest Hubs and Linkages/Corridors
City of Aiken Environmental Assessment

Legend
- Comprehensive Planning Area
- Highways/Major Arterials
- Railroad
- County Rivers
- County Lakes

Field Evaluation Sites
Ecological Criteria Score
- Low
- Medium
- High

- Sample sites with a low score may have restoration potential or provide an important ecological function.

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### Species Richness

#### City of Aiken Environmental Assessment

**Legend**
- ScreenFin
- Comprehensive Planning Area
- Highways/Major Arterials
- Railroad
- County Lakes
- County Rivers

**Field Evaluation Site**

<table>
<thead>
<tr>
<th>Ecological Criteria Score</th>
<th>Species Richness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low*</td>
<td>Low : 0</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium : 101</td>
</tr>
<tr>
<td>High</td>
<td>High : 241</td>
</tr>
</tbody>
</table>

*Sample sites with a low score may have restoration potential or provide an important ecological function.*
### Methodology

**Analysis**

- Development of suitability metrics and values for various ecological attributes
- Application of suitability values to the site

<table>
<thead>
<tr>
<th>RESOURCE ELEMENT</th>
<th>ECOLOGICAL ATTRIBUTE</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildlife habitat</td>
<td>Hub</td>
<td>Large (at least 250 acres)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>natural resource areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 x</td>
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</tbody>
</table>
Methodology

- Analysis
  - Overlay and Identification of ecological suitability

Disturbance will result in no or marginal ecological impact

Disturbance acceptable if BMPs or restrictions are applied

Disturbance will compromise ecological integrity

Regulatory restrictions or conservation area
Resource Element – DNR Wetlands

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<table>
<thead>
<tr>
<th>General Wetland Classification</th>
<th>Riparian Buffer</th>
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<tbody>
<tr>
<td>Estuarine</td>
<td>100 FT</td>
</tr>
<tr>
<td>Palustrine</td>
<td></td>
</tr>
<tr>
<td>Riverine</td>
<td></td>
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</table>
Resource Element – FEMA Flood Zone and Storm Surge

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Resource Element – DNR Habitat Assessment

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DNR Habitat Assessment Type
- Potential Forest Interior Dwelling Species Habitat
- Sensitive Species Project Review Areas
- Green Infrastructure Corridor, Hub and GAP Areas
Analysis – Composite Metric
Suitability Analysis

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• Up to 250 ac of a 1,000 ac parcel to be developed sustainably over next 50 yrs.
• Currently small regional airstrip surrounded by mixed hardwood and pine forest.
Inventory – Morphology
Inventory – Water Resources
Inventory – Landscape Ecology
Inventory – Conservation Areas
Biohabitats
Incorporated

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UNC North Campus
Ecological Analysis
Composite Metric
Suitability Analysis

Logistic
Risk assessment of habitat quality

Greenbelt Analysis
Score
Low
Medium
High

Carolina North Ecological Assessment
Phase 1 – First 15 Years
Phase 1 Principles

- Respect the ecology of the site
- Focus on transit-oriented development
- Create a sense of identity and place
- Provide appropriate local connections for bike, pedestrian, transit & roadways
- Design for efficient land use with appropriate density
- Mimic the natural, undisturbed infiltration capacity of the land
Sustainable Planning and Design

…8 tools to consider

1. Dialogue
2. Aspiration and Vision Setting
3. Story of Place
4. Scenario Planning
5. Process Assessment
6. Pattern Recognition
7. Whole Systems Understanding
8. Deep Integrated design